ME 478 Homework #3

Consider a bar that is loaded axially with a distributed load T_x as shown in Figure 1. You should note that T_x is zero at the left and increases to 600 lbf at the right end of the rod. Example 3.13 in Logan will be a good source of help for this problem.

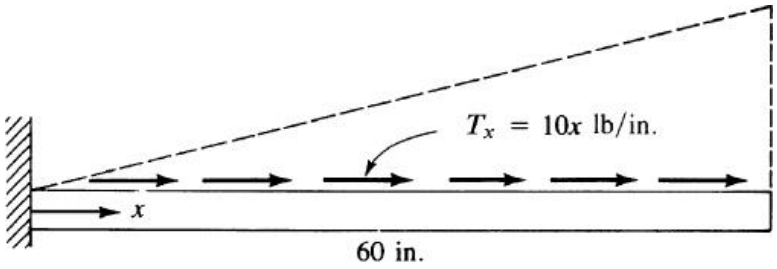

Figure 1. Axially loaded bar.

1) For a one-element model, what is the *concentrated* load matrix $\{P\}$ for the reaction load at the wall?

2) For a one-element model, what is the *distributed* load matrix? The distributed load matrix can be evaluated by

$$\{F_0\} = \int_0^L [N]^T \{T_x\} dx$$

3) What is the load matrix $\{f\}$ for a one-element model? The $\{f\}$ matrix is found by the sum of all load matrices on an element.

4) Using an FEM approach, solve for the nodal displacements using a one-element model and four-element model.

5) Plot the nodal displacements you found for part 4 on the same graph.

6) Which analysis in part 4 is best for finding the deflection at the free end (x = 60 in)? Which analysis is best for finding the deflection at a location between the nodes?